B.C. Hydro

Murphy Creek Transmission Corridor Selection Studies

Corridor Alternatives Summary
by B.C. Hydro

Summary of preliminary environmental assessment studies for Murphy Creek Transmission by Tera Environmental Consultants Ltd.

July 1982

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MURPHY CREEK TRANSMISSION CORRIDOR SELECTION STUDIES

CORRIDOR ALTERNATIVES SUMMARY

BY B.C. HYDRO

SUMMARY OF PRELIMINARY ENVIRONMENTAL ASSESSMENT STUDIES

FOR MURPHY CREEK TRANSMISSION

BY TERA ENVIRONMENTAL CONSULTANTS LTD.

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MURPHY CREEK TRANSMISSION CORRIDOR SELECTION STUDIES

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PREFACE

B.C. Hydro is planning to submit an application to the Ministry of Energy, Mines and Petroleum Resources for an Energy Project Certificate for the Keenleyside and Murphy Creek hydroelectric generation projects. Included in the application will be information on the transmission requirements associated with each of the generation projects.

As part of the preparation for the application, engineering, economic and environmental studies have been carried out to identify feasible transmission corridors and to evaluate their suitability. This report, divided into Sections A and B, presents summary information for the Murphy Creek project. Section A is a synopsis of pertinent information relating to engineering, economic and environmental factors and concludes with a corridor nominated as the best overall choice. Section B is a summary of the environmental impact of a transmission line in each corridor and has been prepared by Tera Environmental Consultants Ltd. In both sections the lengths of the corridors are based on map measurements and are subject to change depending on final alignment. This information is being made available prior to the beginning of the public consultation program which will include meetings to be held in areas potentially affected by the location of transmission lines.

The purpose of the consultation program is to provide the public an opportunity to express their comments and concerns relating to the various corridor alternatives. The results of the meetings will be placed on record and will be considered along with engineering and cost information in arriving at the selection of a route to be included in the application for the generation project.

More information on the environmental aspects of the transmission corridors can be found in the report entitled "Preliminary Environmental

Assessment Studies for Murphy Creek Transmission", May 1982, prepared by Tera Environmental Consultants Ltd. of Vancouver. Copies of the summary reports and the environmental reports for transmission for both this project and the Keenleyside project are available at public libraries in Trail, Castlegar and Nelson and from the B.C. Hydro office in Vancouver. If you require further information, please contact:

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A

CORRIDOR ALTERNATIVES SUMMARY

BY B.C. HYDRO

CORRIDOR ALTERNATIVES SUMMARY

(a) Project

B.C. Hydro is evaluating the feasibility and resultant implications of constructing hydroelectric generation facilities on the Columbia River in the Trail/Castlegar area. These projects would include the addition of generation capability to the existing Hugh Keenleyside Dam northwest of Castlegar and the construction of a new dam, Murphy Creek, at St. Mary's Rock, approximately 3 km upstream of Trail.

The Hugh Keenleyside Dam was originally constructed under the terms of the Columbia River Treaty for the purpose of stream regulation and flood control. It will continue to fulfill that function. The addition of generation facilities would provide about 850 billion watt hours per year (850 GW.h/a) of electric power from an installed capacity of approximately 210 million watts (210 MW). The new Murphy Creek Dam would provide about 2000 billion watt hours per year (2000 GW.h/a) from an installed capacity of approximately 300 million watts (300 MW).

Development of these generation projects would require high voltage lines to transmit power from the dam site to the B.C. Hydro electric grid. System studies indicate that a single 230 000 V (230 kV) transmission connection should be considered between Keenleyside and existing Kootenay Canal Substation. A similar link is under study between the Murphy Creek Dam site and the existing Selkirk Substation, as well as a line between Keenleyside and Murphy Creek dams. The Murphy Creek to Selkirk study area and corridors are shown in Section B, "Summary of Preliminary Environmental Assessment Studies for Murphy Creek Transmission" Fig. 1 and Fig. 2.

(b) Corridor Studies

Each of these corridors shown on Fig. 2 was studied for technical feasibility and environmental impacts that would be associated with routing transmission along the corridor. Capital cost (including overhead, inflation, interest during construction and right-of-way acquisition) is included in the following corridor comparisons for a single circuit wood pole H-frame (as shown in Figs. 3 and 4) 230 kV transmission line.

B.C. Hydro contracted Tera Environmental Consultants Ltd. of Vancouver to carry out an environmental assessment of all these corridors. The consultant conducted two separate studies:

1. Transmission for Keenleyside which includes the Keenleyside to Kootenay Canal and Keenleyside to Murphy Creek corridors.

2. Transmission to Murphy Creek which includes the Murphy Creek to Selkirk corridors.

The consultant produced a preliminary environmental assessment report for each of these study areas. A summary of the environmental evaluation prepared by the consultant for the corridors associated with Murphy Creek follows. A separate summary document entitled Keenleyside Transmission Corridor Selection Studies is provided for the Keenleyside corridors.

(c) Corridor Comparison

The consultants ranked each corridor based on the potential environmental impact of 230 kV transmission routed along the corridor. A cost comparison and technical corridor evaluation was undertaken by B.C. Hydro. A preferred corridor was identified taking all these factors into consideration.

The following corridors were considered technically feasible between Murphy Creek Dam site and Selkirk Substation.

(i) Champion Lake Corridor (26 km)

This corridor ascends the western slope of Mount Heinze and proceeds east past the south end of Champion Lakes Provincial Park to Park Siding on Highway 3B. At this location it adjoins the existing Ashton Creek to Selkirk 500 kV and Kootenay Canal to Selkirk 230 kV right-of-way and parallels it south to Selkirk substation.

The terrain between Murphy Creek and Park Siding is moderate to difficult for transmission construction particularly the steep ascent of Mount Heinze. There is some existing access in this area, however new access will be required. The area is also quite heavily forested requiring relatively good access for logging and clearing operations. Between Park Siding and Selkirk there is access along the existing transmission lines, however there are numerous steep difficult sections which will require new access construction.

Construction cost including overhead, interest during construction, inflation and right-of-way acquisition is estimated to be $17.0 million.

The environmental consultants preferred this corridor over the other five options available (see Section B, page 4, following).

(ii) Fruitvale-Montrose Corridor (19 km)

This is the shortest corridor studied. Similar to the Champion Lakes Corridor, it climbs the steep western flank of

Mount Heinze and then heads in a more direct, southeastern direction towards Selkirk. It crosses the Beaver Valley between Fruitvale and Montrose. The terrain between Murphy Creek and Beaver Valley is similar to the Champion Lakes Corridor, however there is better existing access due to logging activity in the area. This corridor does not have the steep difficult sections posed by the Champion Lakes corridor between the Beaver Valley and Selkirk substation.

This alternative would be the least expensive to build with an estimated cost of $12.6 million, which includes overhead, interest during construction, inflation and right-of-way acquisition.

The environmental consultants ranked this corridor as a third choice based on environmental considerations (see Section B, page 5, following).

(iii) South of Montrose Corridor (20 km)

This corridor traverses the north slope of the Columbia River above the communities of Sunningdale, Glenmerry and Waneta Junction to a crossing of Highway 3B and the Beaver Valley between the Columbia River and Montrose. It then ascends the western slope of Blizzard Mountain and adjoins the existing Nicola to Selkirk 500 kV right-of-way which it follows for approximately 3 km to Selkirk Substation.

The terrain along this corridor is relatively well suited for transmission construction. The egress from the Murphy Creek damsite is not as steep as the previously described corridors and a series of rock benches to the east will enable the line to be located in such a manner as to not be highly visible from the local communities. The lack of forest cover will

also be of benefit in this regard and clearing costs will be substantially less than other corridors. There is also relatively good access throughout the corridor.

B.C. Hydro has estimated the construction cost including overhead, interest during construction, inflation and right-of-way acquisition to be $13.4 million.

The environmental consultants ranked this corridor very close to the preferred option (see Section B, page 5, following).

(iv) Columbia River Corridor (25 km)

This corridor is identical to the South of Montrose Corridor between Murphy Creek and Bear Creek. From this point it swings south across Higway 3B and the Columbia River between Glenmerry and the shopping mall at Waneta Junction. It then adjoins existing W.K.P. & L transmission lines and parallels them along the west bank of the Columbia River to Shepard Flats where it adjoins the existing Nicola to Selkirk 500 kV transmission line. The corridor parallels this line eastward to Selkirk Substation.

The estimated construction cost along this corridor is $20.9 million including inflation, overhead and right-of-way acquisition. It should be noted that this is a relatively expensive corridor due in part to the probable need for expensive steel tower construction at both the Columbia River crossings.

The environmental consultants have determined a middle ranking for this corridor (see Section B, page 6, following).

(v) Warfield Corridor (33 km)

This corridor proceeds southwest from Murphy Creek generally following existing gas pipelines west of Talus Hill and Warfield. It then turns southeast between Rossland and Warfield near the pipeline crossing and follows it across Cambridge Creek below the water supply reservoirs to Lookout Mountain. From here it would continue southwest until it reaches the existing Nicola to Selkirk right-of-way and follow it eastward across the Columbia River to Selkirk Substation.

The terrain along this route is moderately difficult throughout for transmission construction. There are some steep sections near Lookout Mountain. Access is relatively good due to the existing pipelines and transmission lines. It is however, the longest route to be considered.

Construction cost including overhead, interest during construction, inflation and right-of-way acquisition is estimated to be $21.6 million.

The environmental consultants determined this corridor to be the least desirable of all the corridors investigated (see Section B, page 6, following).

(d) Conclusion

After carefully evaluating environmental, economic and technical factors, B.C. Hydro considers the South of Montrose corridor to be the best overall transmission corridor between Murphy Creek and Selkirk Substation. The environmental consultants have determined this corridor to be in very close ranking to their first choice, the Champion Lakes Corridor. The construction cost differential is $3.6 million (taking into account inflation, interest during

construction, overhead and right-of-way costs) in favour of the South of Montrose Corridor.

B

SUMMARY OF PRELIMINARY ENVIRONMENTAL ASSESSMENT STUDIES FOR MURPHY CREEK TRANSMISSION BY TERA ENVIRONMENTAL CONSULTANTS LTD.

SUMMARY OF PRELIMINARY ENVIRONMENTAL ASSESSMENT STUDIES FOR MURPHY CREEK TRANSMISSION

Introduction

In August of 1981, TERA Environmental Consultants Ltd. was contracted by B.C. Hydro to conduct environmental studies for the transmission to connect the proposed Murphy Creek hydroelectric generation project into the B.C. Hydro electric grid. The proposed line would connect the proposed Murphy Creek generation station to the Selkirk Substation. The proposed generation station site is located 3 km upstream on the Columbia River from the city of Trail, and Selkirk Substation is located approximately 15 km southeast of the generation station. The voltage for the proposed transmission line is 230,000 volts (230 kV). Five corridor options were considered. See Figure 2.

This study is designed to meet the requirements of a preliminary planning environmental assessment report in support of the study requirements for the generation project as set by the Ministry of Energy, Mines and Petroleum Resources. Public consultation will be held to determine the most favourable location for the transmission line before detailed studies are undertaken. Social concerns will be dealt with in context with the public meetings. Specifically, the objectives of the preliminary environmental assessment are:

to provide information on the environmental aspects of the proposed transmission line from published information, field reconnaissance and communication with government agencies;

to identify environmentally feasible corridors for the proposed transmission line development;

to rank the feasible transmission line corridors in order of expected cumulative environmental impacts.

Setting

The study area lies in a transition zone between the moist Selkirk Mountains to the northeast, and the drier middle Columbia Valley to the southwest. See Figure 1. Summers are generally hot and dry, while winters are cool and snowy. The terrain in the study area is dominated by the Selkirk Mountains on the east and Monashee Mountains on the west. These mountains ranges are divided by the deep valley of the Columbia River.

The Beaver Creek valley cuts through the Selkirk Mountains from southwest to northeast. The upland area consists of a complex of rounded ridges from about 1,200 to 1,700 m while the major valleys are between 400 and 600 m. These ranges of elevation have greatly affected vegetation and human settlement. The study area is within the Interior Cedar Hemlock biogeoclimatic zone. Major vegetation types include: subalpine parkland and alpine tundra above 1,200 m, forested areas, early successional vegetation (mainly shrubs) in logged areas and areas affected by fire and the Cominco Ltd. smelter fumes, scattered wetlands, and cultivated areas in the major valley. Wildlife resources include deer, bear, beaver, and a wide variety of furbearers. Fisheries resources include rainbow trout, Dolly Varden char, walleye, and sturgeon. Sport fishing is important to the area.

Human activity is concentrated in the major valleys. The city of Trail is a major residential, industrial and commercial centre for the region. The villages of Warfield, Rossland, Montrose and Fruitvale are secondary residential and commercial centres. Rural settlement includes small farms and ranches, rural residences, and hobby farms. These are located in the Columbia River, Beaver Creek, Casino Creek, and Pend d'Oreille

River Valleys. Human activities along the Columbia River date as far back as 10,000 years ago.

Study Approach

In order to accomplish the objectives of the preliminary environmental assessment study, environmental issues were divided into thirteen disciplines: climate, terrain, hydrology, mining, vegetation, agriculture, forestry, wildlife, fish, visual analysis, settlement, recreation and heritage. Professional consultants in each of these disciplines followed a carefully developed methodology to collect inventories of their speciality, assess the impact the development of the proposed transmission line could have, and rank the feasible corridors.

B.C. Hydro provided a prospectus on the Murphy Creek to Selkirk Transmission Studies (August, 1981) which indicated four possible feasible corridors for transmission lines. The consultants reviewed this information and refined and enlarged some of these corridors. A fifth corridor south of Montrose was assessed at a later date at the request of B.C. Hydro.

The consultants identified environmental constraints on transmission line development within the corridors and assessed the potential impacts of transmission line construction and operation within each corridor.

Specific constraints, impacts, and the methodology used for inventory and assessment purposes for each discipline are described in the Preliminary Environmental Assessment report. Assessments of the feasible corridors and the corridor selection process are also included. Recommendations for Mitigation Measures and Specific Recommendations resulting from the preliminary environmental assessment studies are

provided along with recommended terms of reference for Impact Assessment Studies.

Major Potential Impacts

The following is a summary of the areas with a high potential for impacts in each of the feasible corridors. Areas with a high potential for impacts that are located at either the proposed Murphy Creek generation station and the Selkirk Substation are common to all corridors. These are briefly reviewed in the following paragraph but are not addressed in the following corridor summaries.

Potential Impacts Common to All Corridors

There is a potential for impact on terrain because of extensive bluffs and steeplands near the proposed Murphy Creek generation site. Two heritage sites are also located in the area. Avoidance and mitigation could lessen these impacts. There is a potential for impacts on prime agricultural land, class 3 deer winter range and forestry near the Selkirk Substation.

Champion Lakes Corridor

Potential impacts in the Champion Lakes Corridor could affect forestry and vegetation. This corridor contains the oldest forests and the highest percentage of good and medium sites. While the hummocky topography would allow some mitigation in placing structures on poor forest sites, some impacts would be unavoidable. The vegetation in this corridor is the most significant in the study area and has been least damaged by smelter fumes. The Kelly Creek watershed which supplies water to Fruitvale could be affected by erosion during construction activities. Careful mitigation can reduce interference with brook trout in Marsh and Beaver Creeks. Interference with hay production near Beaver Creek could be reduced with careful route selection. Recreational and visual impacts

in Beaver Creek valley could also be minimized with careful route selection.

Fruitvale/Montrose Corridor

The most important concern in this corridor is settlement, particularly in the Fruitvale/Montrose area. There is also a high potential for impacts to visual and recreational resources in the Beaver Creek Valley. The Bath Creek watershed is a community water supply area and careful routing is suggested to avoid impacts. Agriculture in the Beaver Creek Valley could be affected by some structure locations. In both of these cases careful route selection could greatly reduce adverse impacts. This corridor traverses Class 2 and 3 winter range for deer and moose along the Columbia River and Beaver Creek. Forestry and vegetation resources in the Corridor are not as significant as those in the Champion Lakes corridor. Fisheries resources are significant especially in Beaver Creek, however, if structures are located away from stream banks, impacts would be considerably reduced.

South of Montrose Corridor

The most significant concerns along this corridor involve terrain, recreation and heritage. Terrain impacts include potential wind and water erosion of sandy deposits capping fluvioglacial terraces, and a small area of steeplands south of Montrose. Recreation and heritage impacts are centred around the mouth of Beaver Creek although the heritage sites could be spanned. The steep topography at the Beaver Creek crossing may affect settlement, fish and agriculture in this area. The corridor traverses important deer range along the east slope of the Columbia River and north slope of Beaver Creek rated as Class 2 and 3 by the Canada Land Inventory. Impacts on vegetation or forestry resources are expected to be minor in the corridor.

Columbia River Corridor

Heritage, agriculture, and terrain concerns are important in this corridor. In addition to the three heritage sites affected by all alternate corridors, nine heritage sites lie in or near this corridor. The entire route must be assessed as having high potential for unrecorded sites based on site density and the apparent importance of the Columbia Valley in the socio-economic patterns of both the recent historic and prehistoric past.

The corridor traverses fluvioglacial terraces covered by sand and silt cappings. These are capable of producing commercial yields of a wide variety of crops if they are irrigated. These same areas are also subject to wind and water erosion and should therefore not be disturbed. Potential impacts on settlement and visual resources occur at all of the crossings of the Columbia River. This corridor traverses 13 km of Class 2 and 3 deer winter range along the Columbia River and in the Pend d'Oreille valley.

Warfield Corridor

The Warfield Corridor is the longest one considered. It is also the only corridor which does not share the eastern slope of the Columbia River Valley near the proposed Murphy Creek generation station. Seven disciplines identified the Warfield Corridor as the least preferred environmentally. They are: hydrology, mining, wildlife, fish, visual, settlement, and recreation. Potential impacts include: steep colluvial slopes near the important Cambridge Creek watershed which supplies water for Trail; active mineral claims near Rossland, prime agricultural land at the Columbia River Crossing, crossing of Class 2 winter deer range in the Pend d'Oreille valley and Fort Shepherd Flats; potential impact for fish at Violin Lake; a highly visible crossing of Trail Creek; settlement conflicts with Oasis, Riverdale, Rossland and Trail; impact to

the recreational potential near Violin Lake; and potential conflict with at least five known heritage sites.

Selection of Preferred Corridor

Based on the impact assessments by each consultant, the concensus of the consultants was as follows:

The Champion Lakes is the preferred corridor if only environmental concerns are considered;

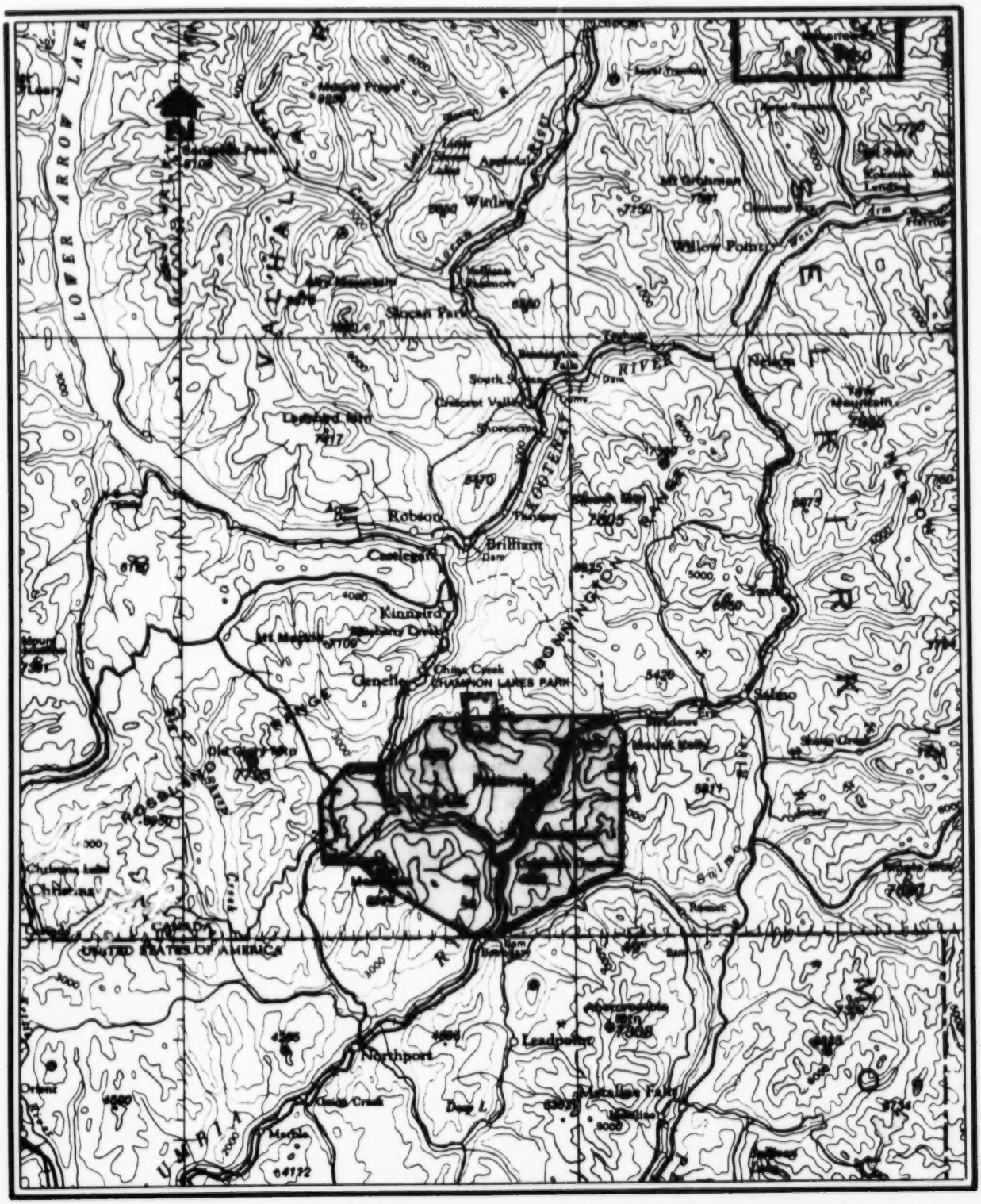
The South of Montrose Corridor is a close second to the Champion Lakes Corridor;

The Columbia River Corridor and Fruitvale/Montrose Corridor are tied for third choice - well behind the first two choices;

The Warfield Corridor is the least preferred choice by a wide margin.

Conclusion

The consulting team felt that there was a clear environmental preference for either the Champion Lakes or South of Montrose corridors. The importance of settlement concerns to the study area was largely responsible for preferring Champion Lakes Corridor. If this preferred corridor is selected there will be greater impacts on forestry and vegetation than if the South of Montrose Corridor is selected. If the South of Montrose Corridor is chosen, the Beaver Creek crossing is susceptible to impacts to settlement, recreation, heritage, fish and agriculture.


LOWER ARROW LAKE
KOOTENAY
RIVER
Robson
Castlegar
Brilliant
Kinnaird
Genelle
CHAMPION LAKES PARK
Trail
Rossland
Warfield
Montrose
Fruitvale
Salmo
Nelson
Ymir
Willow Point
Arrowhead
Lynx Creek
Leadpoint
Northport
Deep L.
Metaline Falls
Chewelah
Orient
Usk
Boundary Creek
Champion Creek
Old Glory Mtn
Mt. Sheppard
Mt. Roberts
Mt. Fisher
Mt. Brigham
Mt. Loomis
Mt. Ymir
Mt. Willet
Mt. Mackenzie
Mt. Meadow
Mt. Mathew
Mt. Sproat
Mt. Crowe
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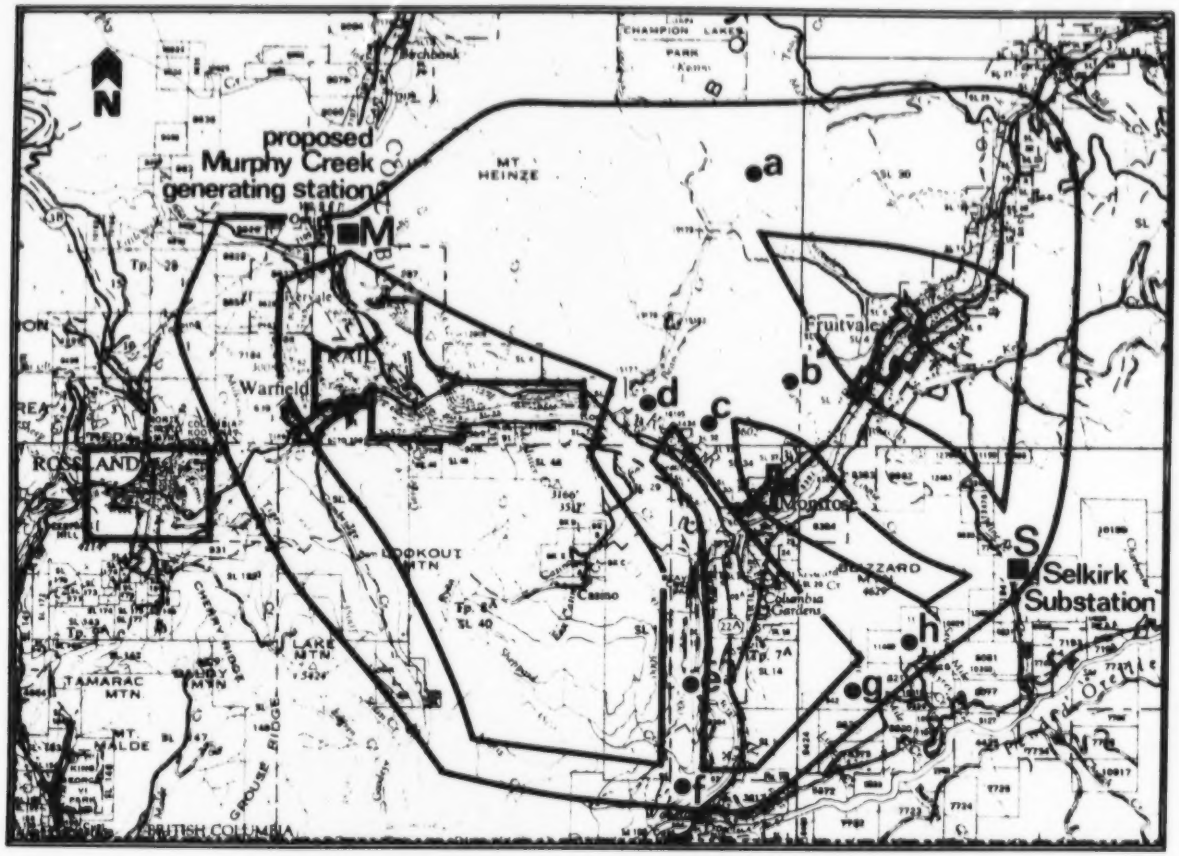
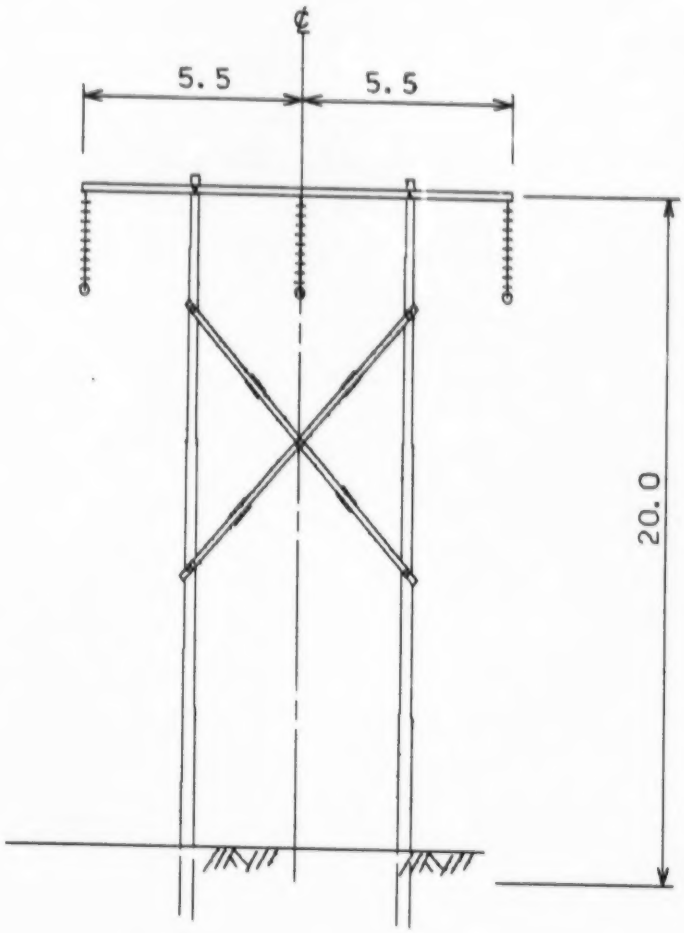


FIGURE 2: MURPHY CREEK CORRIDORS

CORRIDOR	ROUTING	LENGTH
Champion Lakes	M-a-S	26 km
Fruitvale/Montrose	M-b-S	19 km
South of Montrose	M-c-h-S	20 km
Columbia River	M-d-e-f-g-h-S	29 km
Warfield	M-f-g-h-S	32 km

Corridor boundary

Scale of Kilometres



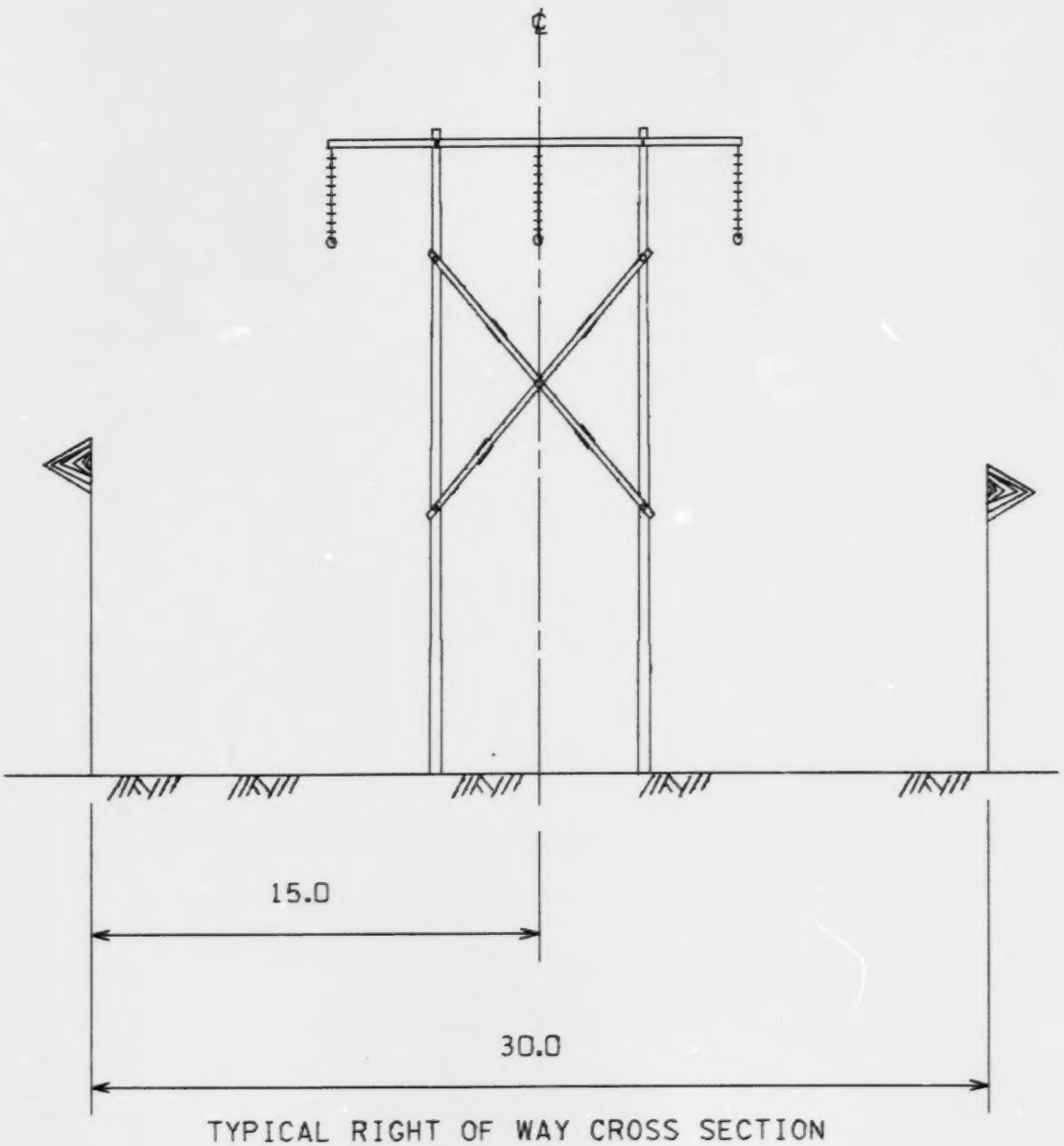
NOTES:

1. ALL DIMENSIONS SHOWN ARE IN METRES.
2. THE HEIGHT SHOWN IS AN AVERAGE HEIGHT.

KEENLEYSIDE/MURPHY CREEK 230 kV TRANSMISSION

WOOD POLE STRUCTURE OUTLINE

FIGURE 3



TYPICAL RIGHT OF WAY CROSS SECTION

NOTES:

1. DIMENSIONS ARE PRELIMINARY .
2. ALL DIMENSIONS ARE IN METRES.

KEENLEYSIDE/MURPHY CREEK

TRANSMISSION

TYPICAL RIGHT OF WAY CROSS SECTIONS

FIGURE 4